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10/527,592	01/23/2006	Daniel K. Sodickson	B0662-70056US01	2287

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EXAMINER
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FETZNER, TIFFANY A

ART UNIT	PAPER NUMBER
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2831

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/527,592	<b>Applicant(s)</b> SODICKSON ET AL.	
	<b>Examiner</b> Tiffany A. Fetzner	<b>Art Unit</b> 2831	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 11 March 2005.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-119 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-119 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 21 March 2008 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                     | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED Final ACTION**

### ***Priority***

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

### ***Claim Objections***

2. The objections to **Claims 43** and **74** are rescinded in view of the remarks and proper citation of the S11 parameter provided by page 20 paragraph 2 of the March 11<sup>th</sup> 2008 amendment and response.

### ***Response to Arguments***

3. Applicant's arguments filed 3/21/2008 have been fully considered but they are not persuasive. Applicant argues that the examiner has not provided a clear description of where a change in a resonant property of the coil array, i.e. the detector array 120 of Mills is found in the prior art. In fact the examiner has provided numerous citations, because applicant's term of "resonant property" is overly broad and non-specific. The applied prior art examines multiple properties which originate from the resonant properties connected to the detector coils, and the resonant properties of the patient/object/subject being examined. Because applicant has not been specific as to which property they consider to be the central focus of the independent claims the examiner considers all of the text relating to any and all of the resonant properties taught by the prior art reference of **Mills** to be a relevant and proper citation of the prior art. The examiner has also provided additional specific examples of a few of the specific resonant properties and where they are found in the rejections of the independent claims below, as per applicant's request for additional citations of at least one specific example of a "resonant property" of the coil array 120. The resonant frequency shift calculated for each individual coil of the array, is one example of a resonant property of the coil array 120, which is determined / measured / calculated, for each coil enabling the property of magnetic susceptibility which is also inter-related to the resonant frequency or resonant properties of the coils and/or the subject being imaged in the NMR device to produce a resonance property related magnetic susceptibility field map.

Therefore the examiner is not persuaded by any of applicant's arguments from page 20 through page 24 paragraph 1.

4. With respect to the argument on page 24 paragraph 4, that **Mills** fails to measure a resonant property, (i.e. examples of resonant properties in Mills with respect to the coils comprise resonant frequency, the shift of resonant frequency, Larmor frequency, the shift of the Larmor frequency and the contribution of each coil / detector/ sensor to the determined magnetic susceptibility map which is also an inter-related result based on the examiner resonant properties of **Mills**. In figure 13 each coil of coil array 120 is shown as sensor 110 which as drawn shows the coupled components of an individual sensor the ability to impedance match while minimizing resistive losses for the components of the antenna array as taught in col. 56 lines 26-56 which suggests at least 2 of a resistive coupling, a capacitive coupling and an inductive coupling between two of more of the plurality of coil elements in the coil array. [See figures 1a, 1b, 8 and especially figure 10 as well.] Therefore claim 99 is taught and/or shown by the Mills reference and this argument by applicant is also not persuasive.

5. With respect to the argument on page 24 last paragraph through page 25, that **Mills** fails to define an electronic model of the coil array, the matrix formed within the electronic computer processor to map out the resonant frequency shift for each of the detector / sensor coils of the array in determining the magnetic susceptibility map is an electromagnetic model of the coil array which receives an induced current having an impedance as per col. 56 lines 26-56, and stores an induced voltage as a function of time. The other limitations of claim 117 come from the teachings of col. 30 line 5 through col. 32 line 46 where the iterations or trials and errors for each coil are performed until the magnetic susceptibility map properly representing the contribution of each coil is obtained based on specific limit tolerances. A measurement of the voltage is a conductivity measurement because it represents how many volts are being conducted by the coils. Therefore this argument is also not persuasive. The **Mills** reference is still considered to be applicable by the examiner to **all 119 currently pending claims** of the instant application, and thus a final rejection is proper.

***Claim Rejections - 35 USC § 102***

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6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

7. **Claims 1-119 are Finally rejected under 35 U.S.C. 102(e)** as being anticipated by **Mills** US patent **6,477,398 B1** issued November 5<sup>th</sup> 2002, filed November 12<sup>th</sup> 1998.

With respect to **Claim 1**, **Mills** shows from figures 1a, 1b, 8 and 13, in combination with the supportive text for these figures in the disclosure. "A method of determining one or more properties" (i.e. one example is magnetic susceptibility / magnetic moment of each voxel, another example is the resonant RF magnetic flux) [See abstract] "of a body" (i.e. component 114) "positioned proximate an array of coils" (i.e. coil array 120) "having one or more resonant properties" (i.e. the examiner notes that one example from the **Mills** reference of a resonant property is the resonant frequency. In the **Mills** reference each coil of array 120 is a resonant frequency detector and each magnetic moment of each voxel for each coil/detector of the array is determined from the shift of the resonant Larmor frequency due to the presence of the voxel(s) in the uniform or nonuniform magnetizing main magnetic field of a nuclear magnetic resonance system. Each voxel corresponds to a unique resonance frequency, which experiences and makes a different contribution to each detector/coil of the array 120. [See col. 30 line 5 through col. 32 line 46; especially col. 30 lines 18-66, and the abstract as one exemplary citation for this limitation]), "the method comprising acts of: detecting a change in at least one resonant property" (i.e. such as a shift in the Larmor frequency, a shift in the resonant frequency), "of at least one of the coils in the array," (i.e. coil/detector array 120) "and determining at least one electromagnetic property" (i.e. the magnetic susceptibility map) "of at least one region of the body from the change in the at least one resonant property." (i.e. a shift or alteration in the resonant or Larmor

frequency, is one example which for each detector of the coil array is plotted out) [See col. 2 line 26 through col. 5 line 17; col. 27 line 57 through col. 33 line 21; col. 54 line 21 through col. 59 line 16 as other detailed in depth examples.]

With respect to **Claim 33 Mills**, shows with respect to figures 1 through 13 and their accompanying description within the Mills disclosure “A method of determining one or more properties” (i.e. such as magnetic susceptibility, external or internal resonant frequency shift, Larmor frequency shift, etc.), “of a body” (i.e. of a patient or object), “the method comprising acts of: positioning the body proximate a plurality of coils;” [See figures 1a, 1b, 8, 13 and accompanying description] “measuring at least one property of at least one of the plurality of coils;” [See figures 1a, 1b, 8, 13 and accompanying description, the abstract, and the text of col. 30 line 5 through col. 32 line 46; especially col. 30 lines 18-66] “and determining at least one electromagnetic property” (i.e. the magnetic susceptibility) “of at least one region of the body” (i.e. the magnetic susceptibility measured / detected in a specific region of a body is a magnetic susceptibility map) [See abstract, col. 30 line 5 through col. 32 line 46] which is determined “from the at least one property” [See abstract, col. 2 line 27 through col. 4 line 65] “based on at least two of a resistive coupling, a capacitive coupling, and an inductive coupling between at least two of the plurality of coils.” [See figures 1a, 1b, 8, and 13, which show the resistive and inductive couplings between the coils.]

With respect to **Claim 61 Mills**, shows with respect to figures 1 through 13 and their accompanying description within the Mills disclosure “An apparatus for determining one or more properties of a body, the apparatus comprising: a plurality of coils having one or more resonant properties;” [See figures 1a, 1b, 8, and 13 and the **rejection of claim 1**] These figures show, in combination with their accompanying description of the **Mills** disclosure “a first component coupled to the plurality of coils and adapted to provide at least one measurement of the plurality of coils indicative of a change in at least one resonant property of at least one of the plurality of coils;” [See the **rejection of claim 1**] “and a second component coupled to the first component” [See figures 1a, 1b, 8, and 13] “to receive the at least one measurement, the second component adapted to determine at least one electromagnetic property of at least one region of the body

based on the change in the at least one resonant property.” [See also the abstract, the rejection of **claim 1**, and the detailed text of col. 11 line 66 through col. 81 line 14 with respect to the figures and the functions of the shown components.]

With respect to **Claim 91 Mills**, shows with respect to figures 1 through 13 and their accompanying description within the Mills disclosure “An apparatus for determining one or more properties of a body, the apparatus comprising: a plurality of coils,” [See figures 1a, 1b, 8, and 13] These figures show, in combination with their accompanying description of the **Mills** disclosure “a first component coupled to the plurality of coils, the first component adapted to provide at least one measurement of at least one property of the plurality of coils; and a second component coupled to the first component to receive the at least one measurement, the second component adapted to determine at least one electromagnetic property of at least one region of the body from the at least one measurement” [See the **rejection of claims 1, 33, and 61**, based on at least two of a resistive coupling, a capacitive coupling, and an inductive coupling between two or more of the plurality of coils.” [See also the abstract, and the text of col. 11 line 66 through col. 81 line 14 with respect to the figures and the functions of the shown components.]

With respect to **Claim 2**, and **corresponding claim 62**, **Mills** teaches “detecting a change in at least one resonant frequency” [See abstract] “of at least one of the coils in the array” [See component 120, and the accompanying text in the disclosure]. The same reasons for rejection, which apply to **claims 1, 61** also apply to **claims 2, 62** and need not be reiterated.

With respect to **Claim 3**, and **corresponding claims 34, 63 and 92** which depend from **independent claims 33, 61, and 91** respectively: **Mills** teaches “determining at least one of a conductivity, a permittivity, and a permeability of the at least one region of the body.” [See col. 4 lines 46-51] The same reasons for rejection, which apply to **claims 1, 33, 61, 91** also apply to **claims 3, 34, 63 and 92** and need not be reiterated.

With respect to **Claims 4, 5**, and **corresponding claims 35, 36, 64, 65, and 93** which depend from **independent claims 33, 61, and 91** respectively: **Mills** teaches “determining at least one of a magnitude, a direction, and a phase of an electromagnetic

(i.e. electric **claims 4, 35, 64, 93**) and (i.e. magnetic **claim 5, 36, 65, 93**) field at the at least one region of the body.” [See col. 6 line 16 through col. 10 line 21] The same reasons for rejection, which apply to **claims 1, 33, 61, 91** also apply to **4, 5, 35, 36, 64, 65, and 93** and need not be reiterated.

With respect to **Claim 6**, and **corresponding claims 37, 66** **Mills** teaches “forming an image having a plurality of voxels, each voxel of the plurality of voxels having an intensity related to a respective one of the at least one electromagnetic property.” [See col. 20 lines 42-65 as one example of this teaching.] The same reasons for rejection, which apply to **claims 1, 33, 61** also apply to **claims 6, 37, 66** and need not be reiterated.

With respect to **Claim 7**, **Mills** teaches “measuring at least one property of the array of coils” (i.e. the frequency) “indicative of the change in the at least one resonant property” (i.e. the magnetic susceptibility) [See co.. 19 line 23 through col. 20 line 65 as one example]. The same reasons for rejection, which apply to **claim 1** also apply to **claim 7** and need not be reiterated.

With respect to **Claim 8**, and **corresponding claims 38, 67 and 94** **Mills** teaches “measuring an impedance characteristic of at least one of the coils in the array.” [See col. 12 lines 55-57; col. 20 lines 27-31; col. 56 lines 26-54.] The same reasons for rejection, which apply to **claims 1, 7, 33, 61, 91** also apply to **claims 8, 38 67, 94** and need not be reiterated.

With respect to **Claim 9** and **corresponding claims 39, 68 and 95**, **Mills** teaches “measuring an impedance characteristic includes an act of obtaining a measured impedance matrix of the array of coils.” [See col. 20 lines 27-65] The same reasons for rejection, which apply to **claims 1, 7, 8, 33, 38, 61, 67, 91, 94** also apply to **claims 9, 39, 68 and 95**, and need not be reiterated.

With respect to **Claim 10**, and **corresponding claims 40, 69 and 96**, **Mills** teaches “obtaining a plurality of scattering parameters (S-parameters) of the array of coils” because the Magnetic susceptibility parameters which define and determine how the electromagnetic field fluctuates in space, represent a plurality of electromagnetic field scattering parameters.” [See the entire disclosure of **Mills** with respect to magnetic



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susceptibility and the parameters used to define, determine and measure it in the **Mills** reference. [See the abstract, figures 1a-13; col. 2 line 26 through col. 81 line 48.] The same reasons for rejection, which apply to **claims 1, 7, 8, 33, 38, 61, 67, 91, 94** also apply to **claims 10, 40, 69 and 96**, and need not be reiterated.

With respect to **Claim 11**, **Mills** shows “providing at least one electrical stimulus to at least one of the coils in the array.” [See figures 1a, 1b, 8, and the accompanying text in the **Mills** disclosure.] The same reasons for rejection, which apply to **claims 1, 7** also apply to **claim 11** and need not be reiterated.

With respect to **Claims 12-17**, and **corresponding claims 44, 45, 100, 101**; **Mills** shows and teaches providing” (**claim 12**) “at least one of a current and a voltage to the at least one coil” [See figures 1a, 1b, 8 and 13; col. 28 lines 42-55 col. 30 line 50 through col. 32 line 46 as one example.]; (i.e. **claim 13**) “a range of frequencies and measuring at least one S-parameter of the array of coils.” [See col. 20 lines 27-65]; (i.e. **claim 14**) “measuring a voltage in the at least one other of the coils in the array.” [See figures 1a, 1b, 8 and 13; col. 28 lines 42-55 col. 30 line 50 through col. 32 line 46 as one example.] (i.e. **claims 15, 44, 100**) “measuring the at least one property” (i.e. such as current or voltage or magnetic susceptibility) “in each of the coils in the array. [See figures 1a, 1b, 8 and 13; col. 28 lines 42-55 col. 30 line 50 through col. 32 line 46 as one example.] (i.e. **claims 16, 45, 101**) “producing a current in each of the coils in the array and measuring a voltage in each of the coils in the array, respectively, in response to the current.” [See figures 1a, 1b, 8 and 13; col. 28 lines 42-55 col. 30 line 50 through col. 32 line 46 as one example.]; (i.e. **claim 17**) “obtaining a measured impedance matrix formed from the plurality of S-parameters.” [See col. 12 lines 55-57; col. 20 lines 27-65; col. 56 lines 26-54; col. 28 lines 42-55 col. 30 line 50 through col. 32 line 46 as one example.] The same reasons for rejection, which apply to **claims 1, 7, 11, 33, 91** also apply to **claims 12-17, 44, 45, 100, 101** and need not be reiterated.

With respect to **Claim 18**, and **corresponding claims 46, 102**; **Mills** teaches “computing a trial impedance matrix from trial values of at least one of conductivity, permittivity and permeability for the at least one region of the body.” [See col. 19 line 23 through col. 32 line 46 with col. 4 lines 46-65 as one example.] The same reasons for

rejection, which apply to **claims 1, 7, 8, 33, 38, 61, 67, 91, 94** also apply to **claims 18, 46 and 102**, and need not be reiterated.

With respect to **Claim 19**, and **corresponding claims 47, 77, 103**: **Mills** teaches and shows “computing values of the trial impedance matrix by solving Maxwell's equations” [see col. 178 line 47] with the trial values”. See col. 19 line 23 through col. 32 line 46 with col. 4 lines 46-65 as one example; as well as all of the various equations drawn from the Maxwell equations found throughout the entire **Mills** disclosure.] The same reasons for rejection, which apply to **claims 1, 7, 8, 18, 33, 38, 46, 61, 67, 91, 94, 102** also apply to **claims 47, 77 and 103**, and need not be reiterated.

With respect to **Claim 20**, and **corresponding claims 48, 78, 104**: **Mills** shows the factors and parameters of the equation of this claim, via the numerous mathematics, equations, and array calculations set forth in the disclosure of col. 2 line 27 through col. 86 line 55 and figure 13 which teach the same principles in a long explanatory dissertation of mathematics. The same reasons for rejection, which apply to **claims 1, 7, 8, 18, 33, 38, 46, 47, 61, 67, 77, 91, 94, 102, 102** also apply to **claims 48, 78 and 104**, and need not be reiterated.

With respect to **Claim 21**, and **corresponding Amended claim 49** which now depends from **claim 33**, **Mills** teaches from the disclosure section of Finite detector length, and the mathematics of the disclosure, the limitation of “computing the trial impedance matrix includes employing a finite difference time domain (FDTD) simulation of a model of the array and the body to compute a plurality of currents flowing in a plurality of coils in the array in response to a plurality of voltages and computing impedance characteristics from the plurality of currents and the plurality of voltages.” [See col. 57 line 6 through col. 81 line 14; and Figure 13.] The same reasons for rejection, which apply to **claims 1, 7, 8, 18, 33, 38, 46, 47, 61, 67, 77, 91, 94, 102, 102** also apply to **claims 21 and 49**, and need not be reiterated.

With respect to **Claim 22**, and **corresponding claims 50, 79, 105** **Mills** teaches “comparing the trial impedance matrix with the measured impedance matrix”, from the teachings of col. 20 line 27-65; col. 19 line 44 through col. 20 line 31; col. 29 line 64 through col. 32 line 46; col. 56 lines 31-54, Figure 13]. The same reasons for rejection,

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which applies to **claims 1, 7, 8, 18, 33, 38, 46, 47, 77, 61, 67, 91, 94, 102, 103** also apply to **claims 50, 79** and **105**, and need not be reiterated.

With respect to **Claims 23, 24, 25**, and **corresponding claims 51, 52, 33, 80, 81, 82, 106, 107, 108**, **Mills** teaches “iteratively updating “ (i.e. claims 25, 82, 107) ” in order to enable reducing a distance between the trial impedance matrix which is expressed as (i.e. susceptibility and detected in terms of voltage) and the measured impedance matrix” (i.e. the values actually detected) (i.e. claims 24, 51, 80) because **Mills** measures impedance for each of the antennas of the array in terms of detected signal voltage and brings the estimated and actual resulting voltages together. [See the teachings of col. 20 line 27-65; col. 19 line 44 through col. 20 line 31; col. 29 line 64 through col. 32 line 46; col. 56 lines 31-54]. **Mills** also shows mathematically that part of this method includes a least squares difference. [See the mathematical formulas provided throughout this reference connected with the taught reiterative, reconstruction method from the teachings of col. 20 line 27-65; col. 19 line 44 through col. 20 line 31; col. 29 line 64 through col. 32 line 46; col. 56 lines 31-54, figure 13] The examiner notes that the formulas are found throughout the text and in the appendices for each of the written described teachings, and not necessarily directly with the teachings themselves. Therefore applicant should refer to all the mathematics provided in the reference connected to the reconstruction algorithm employed by **Mills**.] The same reasons for rejection, which apply to **claims 1, 7, 8, 18, 21, 33, 38, 46, 47, 49, 61, 67, 77, 91, 94, 102, 102** also apply to **claims 51-53, 80-82, and 106-108**, and need not be reiterated.

With respect to **Claims 26**, and **corresponding claims 54, 83, 109**, **Mills** teaches “forming an image of the body, the image having a plurality of voxels, each voxel of the plurality of voxels having an intensity based on corresponding trial values used to compute the final trial impedance matrix. [See col. 25 line 30 through col. 32 line 46; figures 8, 1a, 1b] The same reasons for rejection, which apply to **claims 1, 7, 8, 18, 21, 33, 38, 46, 47, 49, 61, 67, 77, 91, 94, 102, 102, 51-53, 80-82, and 106-108**, also apply to **claims 26, 54, 83, and 109**, and need not be reiterated.

With respect to **Claims 27**, and **corresponding claims 55, 84, 110**, **Mills** shows “providing a model of the array of coils and the body. [See figures 1a, 1b] The same

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reasons for rejection, which apply to **claims 1, 7, 8, 26, 33, 38, 54, 61, 67, 83, 91, 94, 109** also apply to **claims 27, 55, 84** and **110**, and need not be reiterated.

With respect to **Claims 28**, and **corresponding claims 56, 85, 111**, **Mills** shows "logically partitioning a volume of space including at least a portion of the body into a plurality of regions". [See figure 12] The same reasons for rejection, which apply to **claims 1, 7, 8, 26, 27, 33, 38, 54, 55, 61, 67, 84, 91, 94, 109, 110** also apply to **claims 28, 56, 85** and **111**, and need not be reiterated.

With respect to **Claims 29**, and **corresponding claims 57, 86, 112**, **Mills** teaches "assigning at least one of a conductivity value, a permittivity value, and a permeability value to each of the plurality of regions. [See col. 4 lines 46-51] The same reasons for rejection, which apply to **claims 1, 3, 7, 8, 26, 27, 28, 33, 34, 38, 54, 55, 56, 61, 63, 67, 84, 85, 91, 92, 94, 109, 110, 111** also apply to **claims 29, 57, 86** and **112**, and need not be reiterated.

With respect to **Claims 30**, and **corresponding claims 58, 87, 113**, **Mills** teaches "computing a trial impedance matrix from the assigned conductivity, permittivity and permeability values according to the model". [See col. 4 lines 46-51 where permeability different than free space is defined as magnetic susceptibility, and see the teachings of col. 20 line 27-65; col. 19 line 44 through col. 20 line 31; col. 29 line 64 through col. 32 line 46; col. 56 lines 31-54, Figure 13]. The same reasons for rejection, which apply to **claims 1, 3, 7, 8, 26, 27, 28, 29, 33, 34, 38, 54, 55, 56, 57, 61, 63, 67, 84, 85, 86, 91, 92, 94, 109, 110, 111, 112** also apply to **claims 30, 58, 87** and **113**, and need not be reiterated.

With respect to **Claims 31**, and **corresponding claims 59, 88, 114**, **Mills** teaches "reducing a distance between the trial impedance matrix and the measured impedance matrix by iteratively adjusting trial values of the assigned conductivity and permittivity values" because he adjusting the magnetization voltages detected by each voxel. [See col. 4 lines 46-51 where permeability different than free space is defined as magnetic susceptibility, and see the teachings of col. 20 line 27-65; col. 19 line 44 through col. 20 line 31; col. 29 line 64 through col. 32 line 46; col. 56 lines 31-54, Figure 13]. The same reasons for rejection, which apply to **claims 1, 3, 7, 8, 26, 27, 28, 29**,

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**30, 33, 34, 38, 54, 55, 56, 57, 58, 61, 63, 67, 84, 85, 86, 87, 91, 92, 94, 109, 110, 111, 112, 113** also apply to **claims 31, 59, 88** and **114**, and need not be reiterated.

With respect to **Claims 32**, and **corresponding claims 60, 89, 115**, **Mills** shows “performing a finite difference time domain simulation of the mode” [See figures 1c through figure 7, as examples with their corresponding description in the **Mills** disclosure. See also the plotting of the results col. 32 lines 43-46]. The same reasons for rejection, which apply to **claims 1, 3, 7, 8, 26, 27, 28, 29, 30, 31, 33, 34, 38, 54, 55, 56, 57, 58, 59, 61, 63, 67, 84, 85, 86, 87, 88, 91, 92, 94, 109, 110, 111, 112, 113, 114** also apply to **claims 32, 60, 89**, and **115**, and need not be reiterated.

With respect to **Claim 41**, **Mills** shows from figures 1a and figure 8 by means of the drive mechanism and the electrical connection shown the step of “providing a current in at least one of the plurality of coils” (i.e. component 120) “and measuring the at least one property in at least one other of the plurality of coils” {see the abstract, figure 13, figure 8, figure 2 and the teachings of col. 20 line 27-65; col. 19 line 44 through col. 20 line 31; col. 29 line 64 through col. 32 line 46]. The same reasons for rejection, which apply to **claims 1, 7, 8, 10, 33, 38, 40, 61, 67, 69, 91, 94, 96** also apply to **claim 41** and need not be reiterated.

With respect to **Claim 42**, **Mills** teaches “measuring a voltage in the at least one other of the plurality of coils” [See col. 31 line 62 through col. 32 line 46 as one example of this teaching in the **Mills** reference]. The same reasons for rejection, which apply to **claims 1, 7, 8, 10, 33, 38, 40, 41, 61, 67, 69, 91, 94, 96** also apply to **claim 42** and need not be reiterated.

With respect to **Claim 43**, **Mills** teaches “measuring an **S1** [See objection to S11] parameter of the at least one other of the plurality of coils. [See the teachings of col. 20 line 27-65; col. 19 line 44 through col. 20 line 31; col. 29 line 64 through col. 32 line 46; col. 56 lines 31-54, Figure 13]. The same reasons for rejection, which apply to **claims 1, 7, 8, 10, 33, 38, 40, 41, 42, 61, 67, 69, 91, 94, 96** also apply to **claim 43** and need not be reiterated.

With respect to **Claim 70**, and **corresponding claim 97** **Mills** teaches impedance matching [See col. 20 lines 27-33, and shows a matching circuit and a

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network analyzer” from figures 13, 8, 1a, and 1b] The same reasons for rejection, which apply to **claims 61, 96** also apply to **claims 70, 97** and need not be reiterated.

With respect to **Claim 71**, and **corresponding claim 98**, **Mills** shows from figures 8 and 13 “a third component adapted to provide a current in at least one of the plurality of coils and the first component is adapted to measure the at least one property in at least one other of the plurality of coils in response to the current. The same reasons for rejection, which apply to **claims 1, 7, 8, 33, 38, 40, 61, 67, 69, 91, 94, 95, 96** also apply to **claims 71, 98** and need not be reiterated.

With respect to **Claim 72**, and **corresponding claim 99** **Mills** shows from figures 1a, 1b, 8 and 13 “the third component includes an radio frequency (RF) power source. The same reasons for rejection, which apply to **claims 1, 7, 8, 33, 38, 40, 61, 67, 69, 71, 91, 94, 95, 96** also apply to **claims 72, 99** and need not be reiterated.

With respect to **Claim 73**, **Mills** shows from figures 1a, 1b, 8 and 13; and teaches from col. 20 line 27-65; col. 19 line 44 through col. 20 line 31; col. 29 line 64 through col. 32 line 46; the ability to “measure a voltage in the at least one other of the plurality of coils in response to the current.” The same reasons for rejection, which apply to **claims 1, 7, 8, 33, 38, 40, 61, 67, 69, 71, 91, 94, 96** also apply to **claims 73** and need not be reiterated.

With respect to **Claim 74**, **Mills** shows from figures 1a, 1b, 8, and 13; in combination with the teachings of col. 19 line 44 through col. 20 line 31; col. 29 line 64 through col. 32 line 46; that “the first component is adapted to measure an **S1** parameter of the at least one other of the plurality of coils at a plurality of frequencies.” The same reasons for rejection, which apply to **claims 1, 7, 8, 33, 38, 40, 61, 67, 69, 71, 73, 91, 94, 96** also apply to **claims 74** and need not be reiterated.

With respect to **Claim 75**, **Mills** shows from figures 1a, 1b, 8, and 13; in combination with the teachings of col. 19 line 44 through col. 20 line 31; col. 29 line 64 through col. 32 line 46; that “the first component is adapted to measure the at least one property in each of the other coils in the array in response to the current.” The same reasons for rejection, which apply to **claims 1, 7, 8, 9, 33, 38, 39, 61, 67, 68, 91, 94, 95** also apply to **claim 75** and need not be reiterated.

With respect to **Claim 76, Mills teaches** the second component is adapted to compute a trial impedance matrix from trial values of at least one of conductivity and permittivity for the at least one region of the body” because he adjusting the magnetization voltages detected by each voxel. [See col. 4 lines 46-51 where permeability different than free space is defined as magnetic susceptibility, and see the teachings of col. 20 line 27-65; col. 19 line 44 through col. 20 line 31; col. 29 line 64 through col. 32 line 46; col. 56 lines 31-54, Figure 13]. The same reasons for rejection, which apply to **claims 1, 7, 8, 9, 33, 38, 39, 61, 67, 68, 91, 94, 95** also apply to **claim 76** and need not be reiterated.

With respect to **Claim 90, and corresponding claim 116, Mills** teaches in the appendices of the Disclosure, the text of col. 11 line 34 through col. 82 line 14, and the exemplary reconstruction program of column 42 through 54 of the Mills Disclosure “at least one computer readable medium encoded with instructions; and at least one processor coupled to the at least one computer readable medium, the at least one processor configured to execute the instructions.” [See also figures 1a, 1b, and 8, which show the different computational processors 20, 126, 226, and 228] The same reasons for rejection, which apply to **claims 61, 91** also apply to **claim 116** and need not be reiterated.

With respect to **Claim 117, Mills** teaches and shows in the appendices of the Disclosure, the text of col. 11 line 34 through col. 82 line 14, and the exemplary reconstruction program of column 42 through 54 of the Mills Disclosure “A computer readable medium encoded with instructions capable of being executed on at least one processor, the instructions, when executed by the at least one processor, performing a method of determining one or more properties of a body positioned proximate a coil array, the method comprising acts of: defining an electromagnetic model of the coil array; receiving an input including a measured impedance matrix of the coil array; logically partitioning a volume associated with the model of the coil array and the body into a plurality of regions; assigning trial values respectively to each of the plurality of regions, the trial values including at least one of conductivity, permittivity and permeability; generating a trial impedance matrix from the assigned trial values

according to the electromagnetic model of the coil array; and reducing a distance between the trial impedance matrix and the measured impedance matrix.”

With respect to **Claim 118**, **Mills** teaches and shows “generating the trial impedance matrix by implementing a finite difference time domain simulation of the model.” [See figures 1c through figure 7, and figure 13 as examples with their corresponding description in the Mills disclosure. See also the plotting of the results col. 32 lines 43-46]. The same reasons for rejection, which apply to **claim 117** also apply to **claim 118** and need not be reiterated.

With respect to **Claim 119**, **Mills** teaches and shows from the algorithms shown throughout the Mills reference that “the act of reducing the distance includes determining a least squares distance between the trial impedance matrix and the measured impedance matrix by iteratively updating the conductivity and permittivity values such that the trial impedance matrix is closer to the measured impedance matrix on each iteration” [See the mathematics’ and algorithms found throughout the **Mills** reference. . See also col. 4 lines 46-51 where permeability different than free space is defined as magnetic susceptibility, and see the teachings of col. 20 line 27-65; col. 19 line 44 through col. 20 line 31; col. 29 line 64 through col. 32 line 46; col. 56 lines 31-54, Figure 13]. The same reasons for rejection, which apply to **claim 117** also apply to **claim 119** and need not be reiterated.

8. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

9. A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.



***Prior Art***

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

**\*A) Sekihara et al.**, US patent 5,426,365 issued June 20<sup>th</sup> 1995.

**B) Sodickson et al.**, US patent application publication 2006/ 0125475 A1 published June 15<sup>th</sup> 2006, which is applicant's own publication of the instant application, which is noted for purposes of a complete record only.

**Conclusion**

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tiffany Fetzner whose telephone number is: (571) 272-2241. The examiner can normally be reached on Monday, Wednesday, and Friday-Thursday from 7:00am to 2:10 pm., and on Tuesday and Thursday from 7:00am to 5:30pm.

12. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, **Diego Gutierrez**, can be reached at (571) 272-2245. The **only official fax phone number** for the organization where this application or proceeding is assigned is **(571) 273-8300**.

13. Information regarding the status of an application may be obtained from the Patent Application information Retrieval (PAIR) system Status information for published applications may be obtained from either Private PMR or Public PMR. Status information for unpublished applications is available through Private PMR only. For more information about the PMR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PMR system contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/TAF/  
July 10, 2008

**/Brij Shrivastav/**  
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